

# MATERIAL SAFETY DATA SHEET

## 1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology  
Standard Reference Materials Program  
100 Bureau Drive, Stop 2300  
Gaithersburg, Maryland 20899-2300

SRM Number: 3141a  
MSDS Number: 3141a  
SRM Name: Potassium Standard Solution

Date of Issue: 21 June 2006

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**Description:** This Standard Reference Material (SRM) is intended for use as a primary calibration standard for the quantitative determination of potassium. One unit of SRM 3141a consists of 50 mL of a single element solution in a high density polyethylene bottle sealed in an aluminized bag. The solution is prepared gravimetrically to contain a known mass fraction of potassium. The solution contains nitric acid at a volume fraction of approximately 1 %.

**Material Name:** Potassium Standard Solution

### Other Designations:

**Potassium:** Kalium; potash  
**Potassium Nitrate:** Potassium salt; saltpeter; niter  
**Nitric Acid:** Aqua fortis; hydronitrate; azotic acid; engraver's acid.

## 2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component	CAS Registry	EC Number (EINECS)	Concentration (%)
Nitric Acid	7697-37-2	231-714-2	1
Potassium Nitrate	7757-79-1	231-818-8	2.6
Potassium	7440-09-7	231-119-8	1

**EC Classification, R/S Phrases:** Refer to Section 15, Regulatory Information.

## 3. HAZARDS IDENTIFICATION

**NFPA Ratings (Scale 0-4):** Health = 4      Fire = 0      Reactivity = 2

**Major Health Hazards:** Nitric acid and potassium can both cause severe burns if inhaled, swallowed, or absorbed through the skin. Potassium nitrate causes irritation on contact; like other inorganic nitrates, it can also cause severe illness by ingestion.

**Physical Hazards:** Finely divided potassium or potassium nitrate powder (not present in this mixture) may explode when exposed to heat. Potassium may also explode on contact with water or various incompatible materials.

## Potential Health Effects

<b>Inhalation:</b>	Nitric acid, if inhaled, can damage the mucous membranes and respiratory tract, causing spasm, inflammation of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Inhalation of potassium nitrate can irritate the mucous membranes and upper respiratory tract; symptoms may include coughing and difficulty breathing. Inhalation of potassium dust can cause severe burns and ulceration of the mucous membranes and upper respiratory tract.
<b>Skin Contact:</b>	Nitric acid can cause severe skin burns. Effects of acid burns may be delayed. Potassium nitrate causes irritation on contact and may be absorbed through the skin. Contact with solid potassium can also cause severe burns, especially if skin is moist.
<b>Eye Contact:</b>	Nitric acid and solid potassium both can cause severe eye irritation, corneal burns, permanent eye damage, or blindness. Potassium nitrate can cause severe eye irritation.
<b>Ingestion:</b>	Nitric acid can cause severe burns and damage to the GI tract. Ingestion of potassium nitrate can cause abdominal pain, nausea, vomiting, and diarrhea; like other inorganic nitrates, this compound can also cause anemia, kidney disease, and blood abnormalities.

**Medical Conditions Aggravated by Exposure:** The mixture and its three components may aggravate pre-existing disorders of the eyes, skin, cardiovascular system, GI tract, and respiratory tract. Persons with kidney disorders may be more susceptible than others to the effects of excess potassium.

### Listed as a Carcinogen/ Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u>  X  </u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u>  X  </u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u>  X  </u>

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## 4. FIRST AID MEASURES

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**Inhalation:** Move the person to fresh air immediately. If not breathing qualified medical personnel may start CPR or give oxygen if necessary. Get medical aid at once, and bring the container or label.

**Skin Contact:** Remove contaminated clothing and shoes. Flush affected skin with water for at least 15 minutes, then wash thoroughly with soap and water. If burns are severe or if skin irritation persists, get medical aid and bring the container or label. Wash contaminated clothing before reusing.

**Eye Contact:** Remove contact lenses (if any). Do not allow victim to rub eyes or keep eyes closed. Flush eyes with large amounts of running water for at least 30 minutes, keeping eyelids open and raising lids to remove all chemical. Get medical aid at once, and bring the container or label.

**Ingestion:** Contact a poison control center immediately for instructions. Wash out mouth with water, but do not induce vomiting. Get medical aid at once, and bring the container or label.

**Note to Physician (Nitric Acid):** Wash affected skin with 5% solution of sodium bicarbonate (NaHCO<sub>2</sub>). Activated charcoal is of no value. **DO NOT** give bicarbonate to neutralize the material.

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## 5. FIRE FIGHTING MEASURES

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**Fire and Explosion Hazards:** No data are available for this mixture, but it is not believed to be a significant fire or explosion hazard. The behavior of the solution may differ from that of the individual components. Nitric acid does not burn, but it is a powerful oxidizing agent that can react with combustible materials to cause fires. Potassium nitrate is also a strong oxidizer that may ignite on contact with combustible materials.

**Extinguishing Media:** Use extinguishing media appropriate to the surrounding fire: water spray, dry chemical, carbon dioxide, or foam. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen. (These guidelines apply to the mixture; when the components are considered separately, different precautions may apply. For example, potassium in solid form reacts violently with water.)

**Fire Fighting:** Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

**Flash Point (°C):** N/A

**Autoignition (°C):** N/A

**Lower Explosive Limit (LEL):** N/A

**Upper Explosive Limit (UEL):** N/A

**Flammability Class (OSHA):** N/A

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## 6. ACCIDENTAL RELEASE MEASURES

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**Occupational Release:** Notify safety personnel of spills. Surfaces contaminated with this material should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

**Disposal:** Refer to Section 13, Disposal Considerations.

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## 7. HANDLING AND STORAGE

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**Storage:** Store unopened containers of this material in a dry place at room temperature. Protect from physical damage, heat, and light, and isolate from incompatible materials. Use opened containers immediately or discard.

**Safe Handling Precautions:** Wear gloves and chemical safety goggles (Section 8). Engineering controls should maintain airborne concentrations below TLV (Section 8).

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## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

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### Nitric Acid:

ACGIH TLV-TWA: 2 ppm or 5 mg/m<sup>3</sup>

OSHA TLV-TWA: 2 ppm or 5 mg/m<sup>3</sup>

### Potassium Nitrate:

ACGIH TLV-TWA: None established for the identified mixture.

OSHA TLV-TWA: None established for the identified mixture.

### Potassium:

ACGIH TLV-TWA: None established for the identified mixture.

OSHA TLV-TWA: None established for the identified mixture.

**Ventilation:** Use local or general exhaust to keep employee exposures below limits. Local exhaust ventilation is preferred because it can control contaminant emissions at the source, preventing dispersion into the general work area. Refer to the ACGIH document *Industrial Ventilation, a Manual of Recommended Practices*.

**Respirator:** If necessary, refer to the NIOSH document *Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84* for selection and use of respirators certified by NIOSH.

**Eye Protection:** Use chemical safety goggles where dusting or splashing of solutions may occur. See OSHA standard (29 CFR 1910.133) or European Standard EN166. The employer should provide an emergency eye wash fountain and safety shower in the immediate work area.

**Personal Protection:** Wear appropriate gloves and protective clothing to prevent contact with skin.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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Nitric Acid	Potassium Nitrate	Potassium
<b>Appearance and Odor:</b> colorless to slightly yellow liquid, darkens to brown upon aging and exposure to light; irritating, pungent odor	<b>Appearance and Odor:</b> colorless, transparent prisms or white granular powder	<b>Appearance and Odor:</b> a soft, silvery-white metal that tarnishes on exposure to air and becomes brittle at low temperatures; odorless.
<b>Relative Molecular Weight:</b> 63.02	<b>Relative Molecular Weight:</b> 101.11	<b>Relative Molecular Weight:</b> 39.098
<b>Molecular Formula:</b> HNO <sub>3</sub>	<b>Molecular Formula:</b> KNO <sub>3</sub>	<b>Molecular Formula:</b> K
<b>Specific Gravity:</b> 1.05 (10%)	<b>Specific Gravity:</b> 2.11	<b>Specific Gravity:</b> 0.86
<b>Solvent Solubility:</b> decomposes in alcohol	<b>Solvent Solubility:</b> soluble in liquid ammonia and glycerol; insoluble in dilute alcohols, absolute ethanol, and ether	<b>Solvent Solubility:</b> soluble in liquid ammonia, ethylene diamine, and aniline
<b>Water Solubility:</b> soluble	<b>Water Solubility:</b> soluble	<b>Water Solubility:</b> reacts violently with water
<b>Boiling Point (°C):</b> 86 (187°F)	<b>Boiling Point :</b> (°C) 400 (752°F); decomposes with evolution of oxygen.	<b>Boiling Point(°C):</b> 770 (1418°F)
<b>Vapor Density (Air=1):</b> 2.17	<b>Vapor Density (Air=1):</b> N/A	<b>Vapor Density (Air=1):</b> N/A
<b>pH:</b> 1.0 (0.1M solution)	<b>pH:</b> N/A	<b>pH:</b> N/A

**NOTE:** The physical and chemical data provided are for the pure components. No physical or chemical data are available for this solution of potassium and nitric acid. The actual behavior of the solution may differ from the individual components.

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## 10. STABILITY AND REACTIVITY

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**Stability:**      X   Stable               Unstable

Stable at normal temperatures and pressure.

**Conditions to Avoid:** Contact with combustible materials, water, other incompatible materials.

**Incompatible Materials:**

Nitric Acid: Incompatible with numerous materials including organic materials, plastics, rubber, chlorine, and metal ferrocyanide.

Potassium Nitrate: Incompatible with acids, reducing agents, metals, combustible materials, metal salts, and halogens.

Potassium: Incompatible with water and strong oxidizing agents.

**Fire/Explosion Information:** See Section 5.

**Hazardous Decomposition:** Thermal decomposition of nitric acid or potassium nitrate can produce nitrogen oxides (NO, NO<sub>2</sub>, N<sub>2</sub>O). Nitric acid mist or vapor may also be present. Thermal decomposition of potassium compounds can release hydrogen gas, peroxides, or oxides of potassium.

**Hazardous Polymerization:** ☐ Will Occur ☒ Will Not Occur

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**11. TOXICOLOGICAL INFORMATION**

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**Route of Entry:** ☒ Inhalation ☒ Skin ☒ Ingestion

**Nitric Acid:**

Human-oral (LD<sub>50</sub>): 430 mg/kg

Rat-inhalation (LC<sub>50</sub>): 130 mg/m<sup>3</sup>

**Potassium Nitrate:**

Rat-oral (LD<sub>50</sub>): 3750 mg/kg

Rabbit, oral(LD<sub>50</sub>): 1901 mg/kg

Human, estimated lethal dose: 15 – 30 g

**Potassium:**

Mouse-intraperitoneal(LD<sub>50</sub>): 700 mg/kg

**Target Organ(s):** Respiratory tract, eyes, skin, gastrointestinal tract, blood, kidneys, liver.

**Mutagen/Teratogen:** Nitric acid has caused birth defects in animals under experimental conditions, and has also been investigated as a possible mutagen. Potassium and potassium nitrate are not presently classified as reproductive hazards.

**Health Effects:** See Section 3.

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**12. ECOLOGICAL INFORMATION**

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**Nitric Acid, Ecotoxicity Data:**

Green shore crab (*Carcinus maenas*): LC<sub>50</sub> (48 hrs) = 180,000 µg/L

Starfish (*Asterias rubens*): LC<sub>50</sub> (48 hrs) = 100,000 to 330,000 µg/L

Hooknose (*Agonus cataphractus*): LC<sub>50</sub> (48 hrs) = 100,000 to 330,000 µg/L

**Potassium Nitrate:** This compound dissociates completely into potassium ions and nitrate ions when released to water or wet soil. Biodegradation of nitrates may produce nitrites, nitrogen oxides, or ammonia. Ecotoxicity data:

Worm (*Capitella capitata*) LC<sub>50</sub> (28 days): 2650 µg/L

Mosquitofish (*Gambusia affinis*) LC<sub>50</sub> (48 hrs): 31,100 µg/L

Guppy (*Poecilia reticulata*) LC<sub>50</sub> (48 hrs): 219,000 µg/L

**Potassium:** When released to the environment, elemental potassium reacts with water, releasing hydrogen gas and other products.

**Environmental Summary:** The components of this mixture are slightly toxic to some aquatic organisms.

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### 13. DISPOSAL CONSIDERATIONS

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**Waste Disposal:** One or more components of this mixture are a RCRA hazardous waste. Dispose of container and unused contents in accordance with federal, state, and local requirements for acid waste, which vary according to location. Decontaminate containers before recycling. Processing, use, or contamination of this product may change the waste management options.

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### 14. TRANSPORTATION INFORMATION

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**U.S. DOT and IATA:** Nitric Acid Solution, Hazard Class 8, UN2031, Packing Group II

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### 15. REGULATORY INFORMATION

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#### U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4):

Nitric Acid: RQ = 1000 lb.

Potassium Nitrate: Not regulated

Potassium: Not regulated

SARA Title III Section 302: Nitric acid is regulated.

SARA Title III Section 304: Nitric acid is regulated.

SARA Title III Section 313: Nitric acid is regulated; potassium nitrate regulated as N511, Nitrate Compounds.

OSHA Process Safety (29 CFR 1910.119): Nitric acid at higher concentrations ( $\geq 94.5\%$ ) is regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE: Yes

CHRONIC: Yes

FIRE: No

REACTIVE: Yes

SUDDEN RELEASE: No

#### STATE REGULATIONS

California Proposition 65: None of the components are regulated.

#### CANADIAN REGULATIONS

WHMIS Classification:

Nitric Acid: C (oxidizing material), D1A (very toxic material), E (corrosive material)

Potassium Nitrate: C (oxidizing material), D2B (toxic material).

Potassium: B6 (reactive flammable material); E (corrosive material).

WHMIS Ingredient Disclosure List: Nitric acid is regulated.

CEPA Domestic Substances List (DSL): All three components are regulated.

#### EUROPEAN REGULATIONS

EU/EC Classification:

Nitric Acid: O (Oxidizer), C (Corrosive)

Potassium Nitrate: O (Oxidizer); not classified in Annex I of Directive 67/548/EEC; not on a priority list.

Potassium: F (Flammable), C (Corrosive)

Risk Phrases (mixture):

R23 (toxic by inhalation)  
R25 (toxic if swallowed)  
R34 (causes burns)  
R36/37/38 (irritating to eyes, respiratory system and skin)

Safety Phrases (mixture):

S20/21 (when using, do not eat, drink or smoke)  
S28 (wash after contact with skin)  
S45 (in case of accident or illness, see doctor; show label)  
S60 (dispose of this material and its container as hazardous waste)

## NATIONAL INVENTORY STATUS

U.S. Inventory (TSCA): All components are listed.

TSCA 12(b), Export Notification: No components are listed.

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## 16. OTHER INFORMATION

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**Sources:**

Hazardous Substances Data Bank (HSDB): Potassium and Potassium Nitrate.

IUCLID Chemical Data Sheet: Potassium Nitrate. European Chemicals Bureau, 19 February 2000.

IUCLID Chemical Data Sheet: Nitric Acid. European Chemicals Bureau, 19 February 2000.

PAN Pesticide Database: Nitric Acid.

PAN Pesticide Database: Potassium Nitrate.

U.S. National Institute for Occupational Safety and Health, *NIOSH Pocket Guide to Chemical Hazards*, June 1990 edition. DHHS (NIOSH) Publication No. 90-117.

**Disclaimer:** Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.